Aug. 24, 1943. J. S. McDONALD ET AL 2,327,362

IMPROVEMENT IN WELL TOOLS

Filed Oct. 5, 1940 5 Sheets-Sheet 1

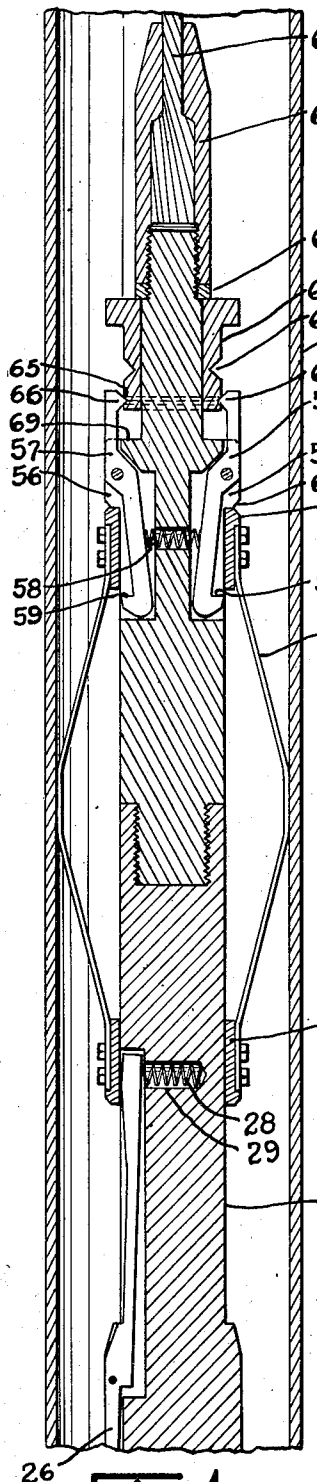


Fig. 1.

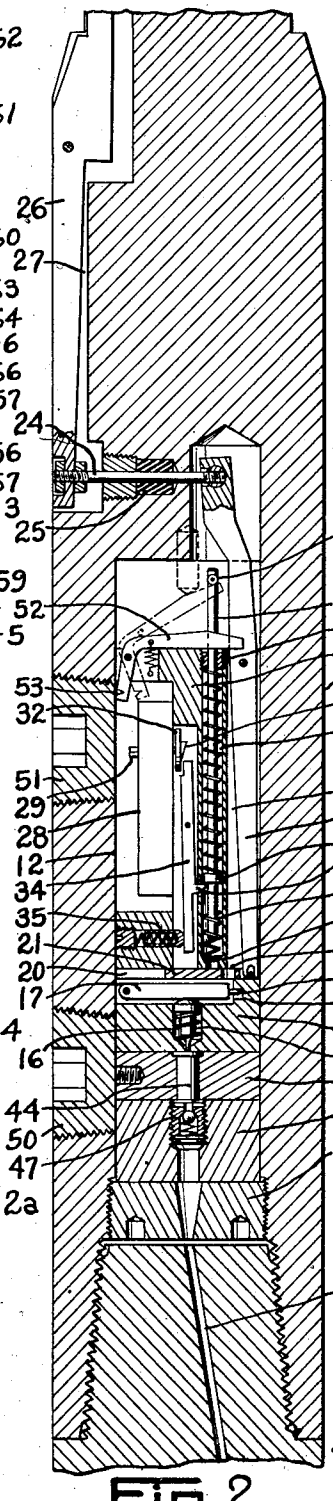


Fig. 2.

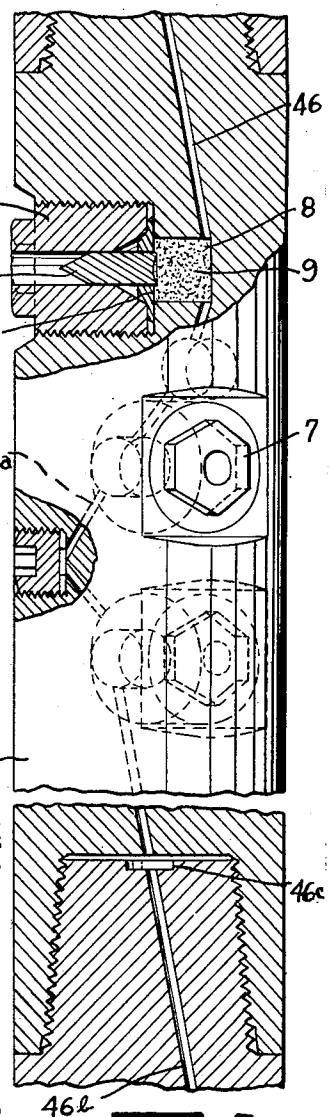


Fig. 3.

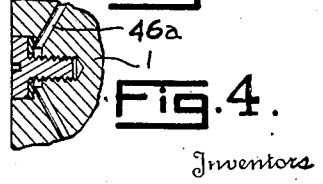


Fig. 4.

Inventors

JOSEPH S. McDONALD

WALTER E. A. RUSKA

By E. V. Hardway Attorney

Aug. 24, 1943. J. S. McDONALD ET AL 2,327,362

IMPROVEMENT IN WELL TOOLS

Filed Oct. 5, 1940 5 Sheets-Sheet 2

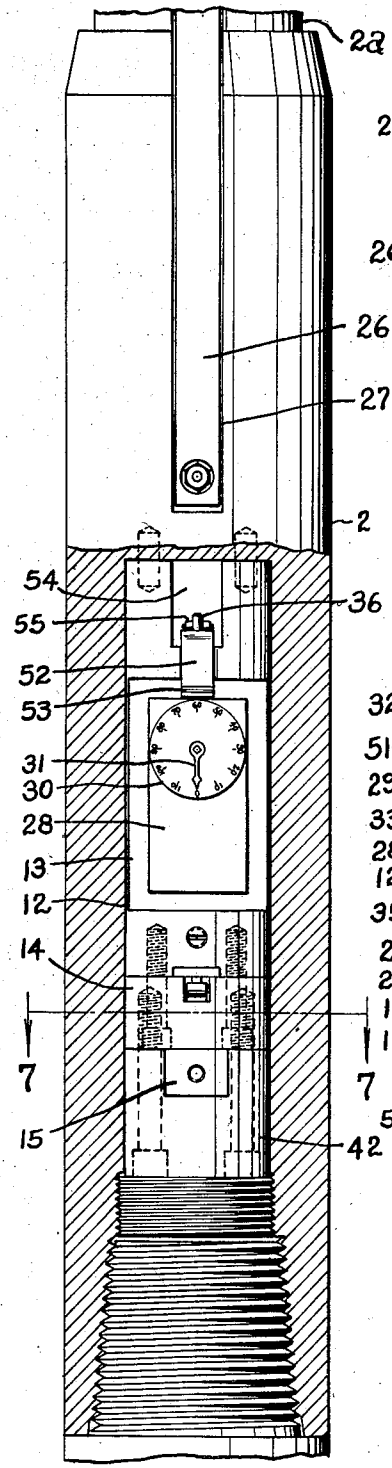


Fig. 5

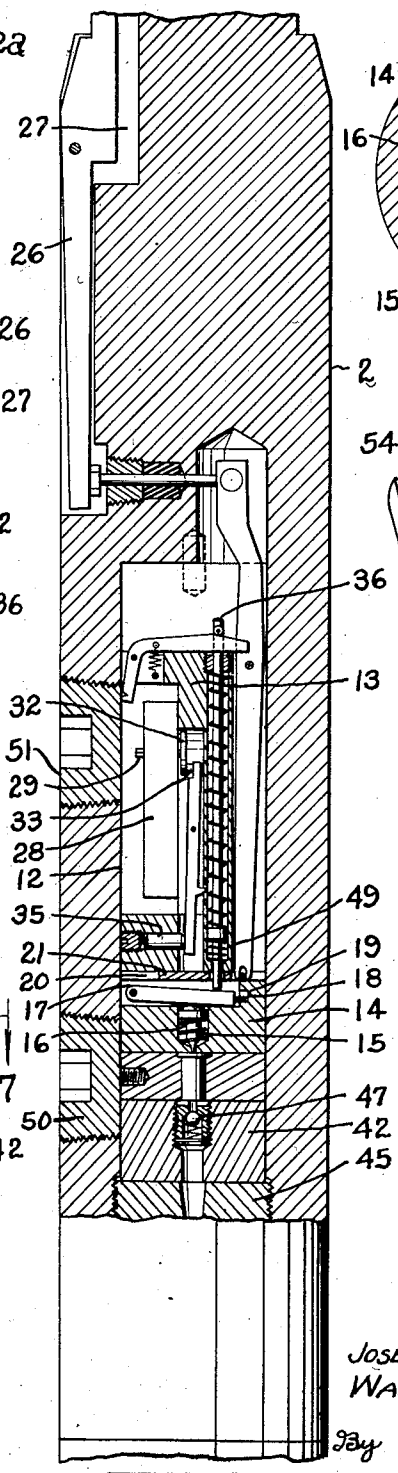


Fig. 6

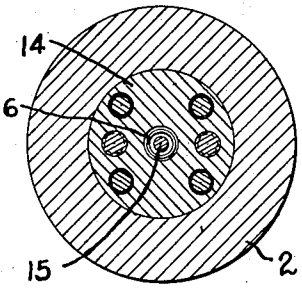


Fig. 7.

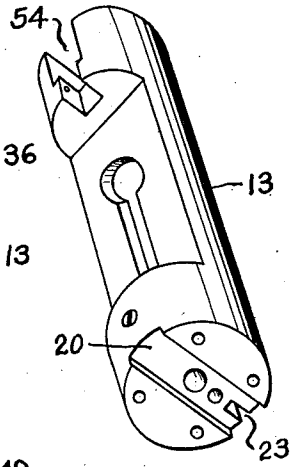


Fig. 8.

Inventors
JOSEPH S. McDONALD
WALTER E. A. RUSKA
By E. V. Hardway
Attorney

Aug. 24, 1943. J. S. McDONALD ET AL 2,327,362

IMPROVEMENT IN WELL TOOLS

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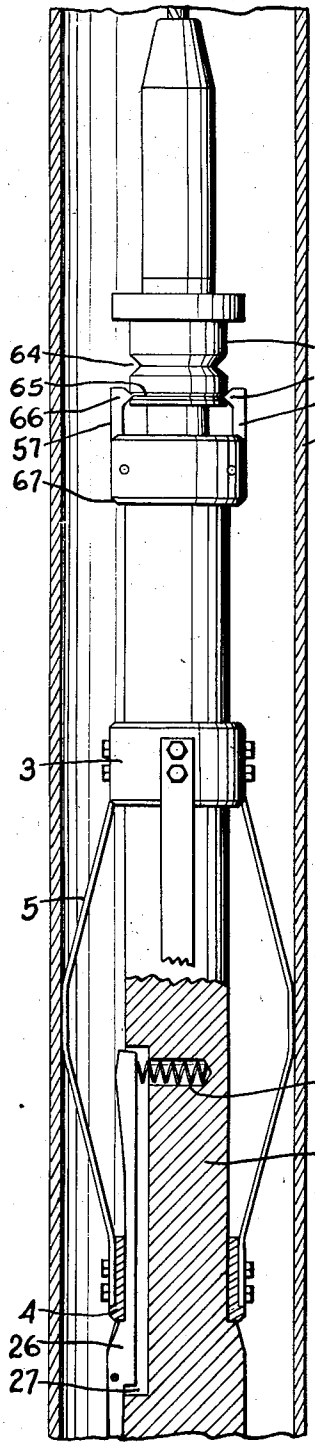


Fig. 9.

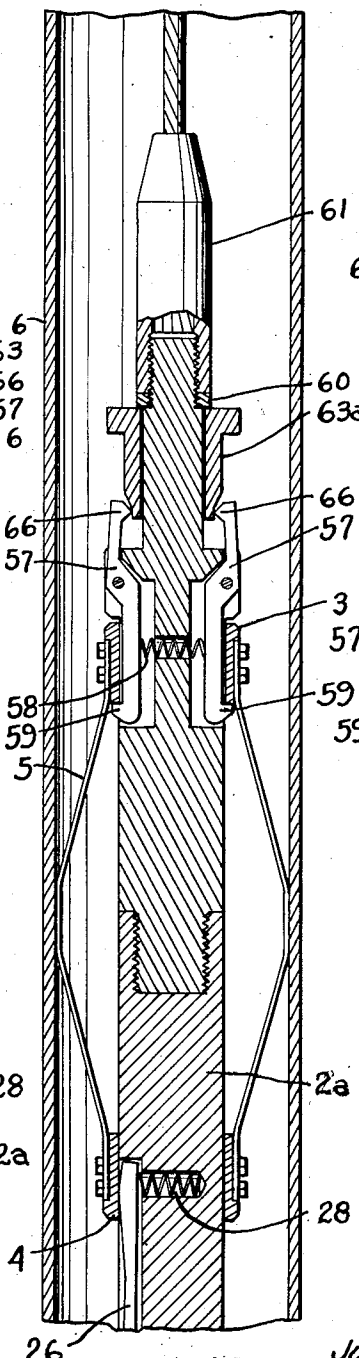


Fig. 10.

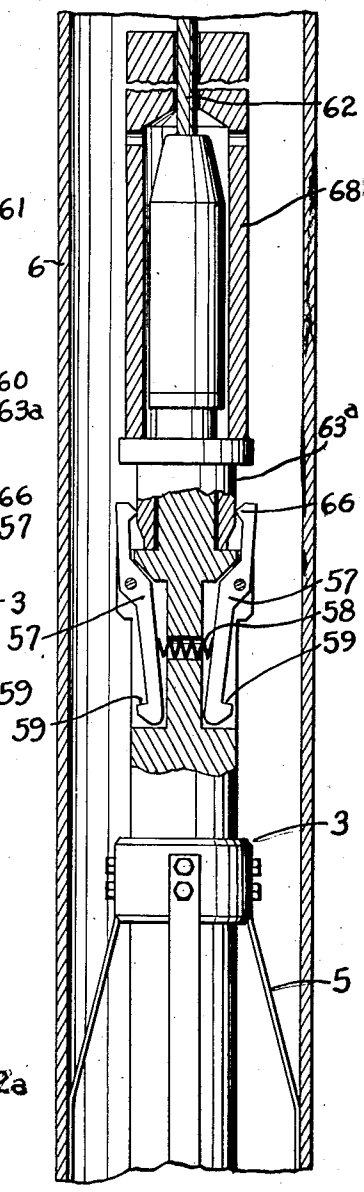


Fig. 11.

Inventors
JOSEPH S. McDONALD
WALTER E. A. RUSKA

By

E. V. Hardway Attorney

Aug. 24, 1943. J. S. McDONALD ET AL 2,327,362

IMPROVEMENT IN WELL TOOLS

Filed Oct. 5, 1940 5 Sheets-Sheet 4

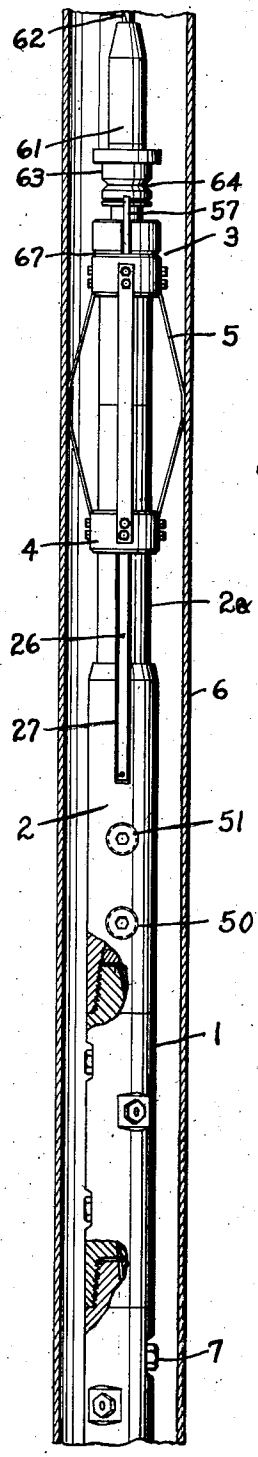


Fig. 13.

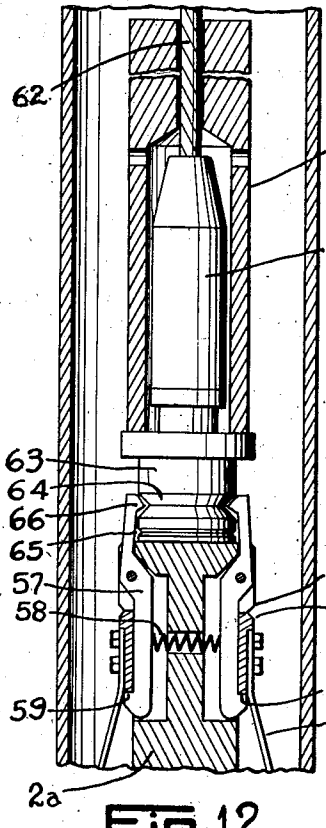


Fig. 12.

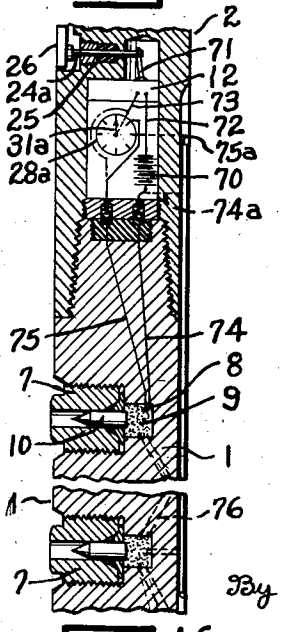


Fig. 16.

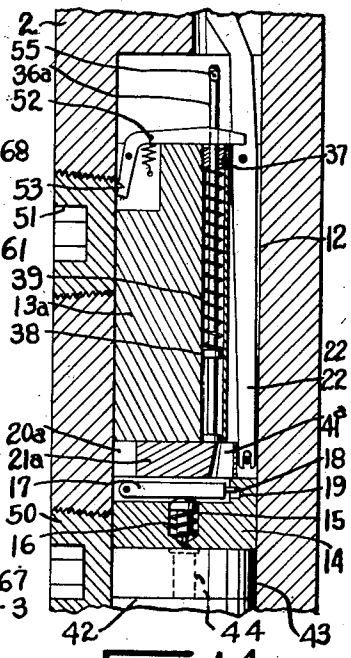


Fig. 14.

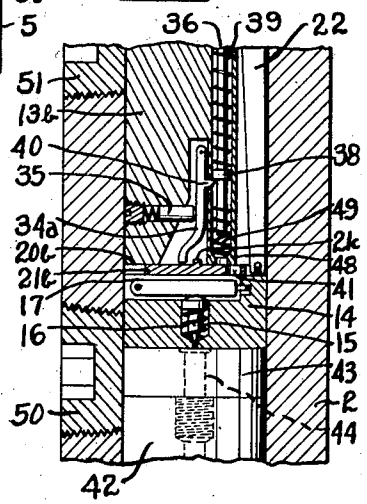


Fig. 15.

Inventors
JOSEPH S. McDONALD
WALTER E. A. RUSKA

By E. V. Hardway
Attorney

Aug. 24, 1943. J. S. McDONALD ET AL 2,327,362

IMPROVEMENT IN WELL TOOLS

Filed Oct. 5, 1940 5 Sheets-Sheet 5

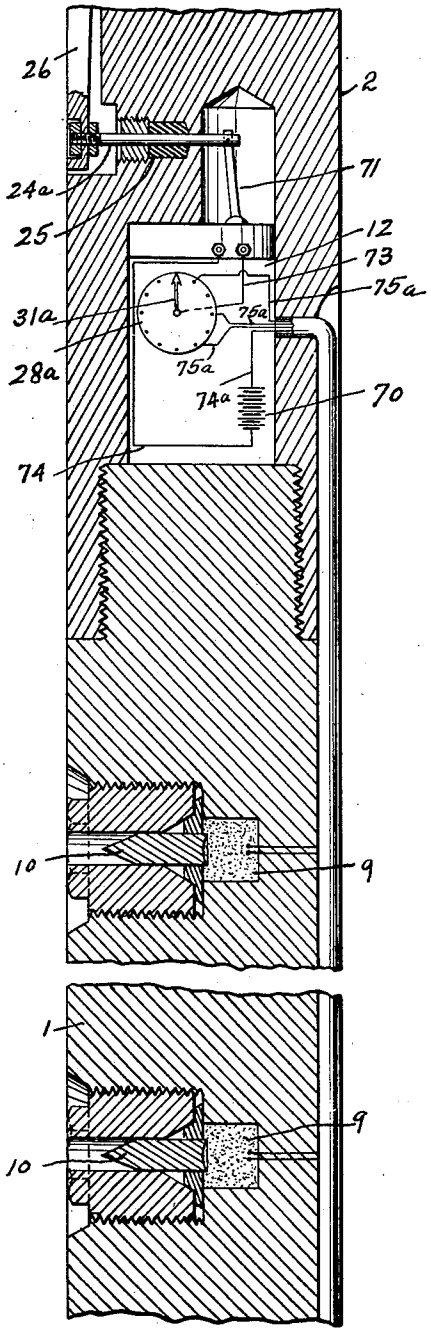


Fig. 17.

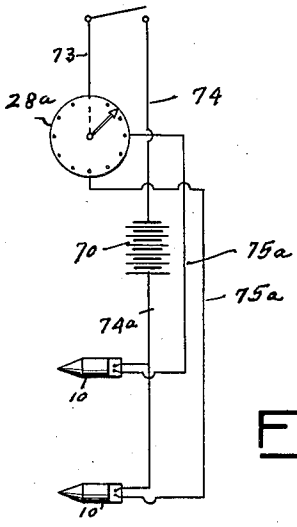


Fig. 18.

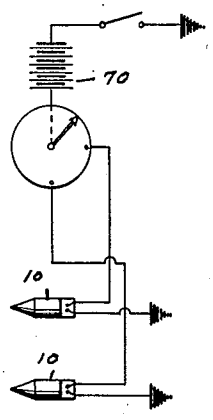


Fig. 19.

Inventor
JOSEPH S. McDONALD.
WALTER E.A. RUSKA.

By E. V. Hardway.
Attorney

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Patented Aug. 24, 1943

2,327,362

UNITED STATES PATENT OFFICE

2,327,362

IMPROVEMENT IN WELL TOOLS

Joseph S. McDonald and Walter E. A. Ruska, Houston, Tex., assignors to Well Tool Development Corporation, a corporation of Texas

Application October 5, 1940, Serial No. 359,862

73 Claims. (Cl. 164—0.5)

This invention relates to well tools.

In drilling wells it is common practice to set a casing in the well bore and to thereafter perforate the casing opposite producing strata to permit the inflow of fluid from the stratum opposite the perforations.

It is an object of the present invention to provide a perforating gun which will effectively perforate the casing at the selected location in the well.

It is another object of the invention to provide a gun of the character described embodying a stock with projectiles mounted therein so as to be projected radially therefrom through the casing by explosive charges with novel means under the control of the operator for controlling the firing of the charges.

Another object of the invention is to provide in a gun of the character described a time control and actuated timing device for tripping the firing mechanism at a selected time with a safety device under the control of the operator for rendering the firing mechanism inoperative to fire the charge in case, for any reason, it should become undesirable to fire the charge, or charges, when the timing device actuates the firing mechanism.

It is a further object of the present invention to provide novel means for resetting the firing mechanism.

A further feature of the invention resides in the provision of novel means for delaying the ejection of the projectile, said means forming also an effective seal to protect the explosive charge against outside moisture.

It is another object of the invention to provide a perforating gun for well casings having a safety slide which is locked in position to render actuation of the firing mechanism ineffective while the gun is being lowered into the well but which safety slide may be moved to inactive position by the operator when the gun has been lowered to the selected position for perforating the casing.

One form of the invention also embodies means for locking the safety slide in position to render the firing mechanism inoperative to ignite any charges while the gun is being either lowered into or raised from the well; said locking means being arranged to be released at the will of the operator to allow the operator to move the safety slide to inactive or active position at will.

In another embodiment of the invention the timing device has been dispensed with and a combined safety device and firing mechanism has been employed whereby the charge, or charges, may be fired at a time selected by the operator and by a movement of the gun at the will of the operator.

In still another form of the invention means, under the control of the operator, have been provided for electrically firing the charge, or charges, either simultaneously or in succession.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, examples of which are given in this specification and illustrated in the accompanying drawings, wherein:

Figures 1, 2 and 3 show vertical, sectional views, respectively, of the upper, intermediate and lower sections of one form of the gun showing the firing mechanism cocked and the safety slide in active position.

Figure 4 shows a fragmentary, sectional view of a slight modification of the construction illustrated in Figure 3.

Figure 5 shows a side view, partly in section, of an intermediate section of the gun taken at right angles to the view shown in Figure 2.

Figure 6 shows a side view, partly in section, of an intermediate section of the gun showing the safety slide inactive and the firing mechanism in active position to fire the charge.

Figure 7 shows a cross-sectional view taken on the line 7—7 of Figure 5.

Figure 8 shows a perspective view of the skeleton frame for the firing mechanism.

Figure 9 shows a side view, partly in section, of the upper section of the form of gun shown in Figure 1 illustrating the locking means for the safety slide shown in position to render said slide inactive.

Figures 10 and 11 show vertical, sectional views, respectively, of another embodiment of the locking device for locking the safety slide inactive and shown in locked and released positions respectively.

Figure 12 shows a fragmentary, vertical, sectional view illustrating means for rendering the safety slide locking device inoperative.

Figure 13 shows a fragmentary, vertical, sectional view of the form of gun illustrated in Figures 1, 2 and 3.

Figure 14 shows a fragmentary, vertical, sectional view of another embodiment of the invention.

Figure 15 shows a similar view of still another embodiment.

Figure 16 shows a fragmentary, vertical, sec-

tional view illustrating self-contained means for electrically firing the charges.

Figure 17 shows a fragmentary, vertical, sectional view illustrating a modified form of the self-contained means for electrically firing the charges, and

Figures 18 and 19 show diagrammatical views of electrical hook-ups employed.

Referring now more particularly to the drawings wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates the gun body or stock which is preferably formed of separable sections, for convenience in manufacture and which is preferably cylindrical in form. The stock 1 is connected to the housing 2, above, for the operating mechanism and the upper end of the housing is preferably reduced in diameter forming the mandrel, or shank, 2a which is surrounded by the upper and lower collars 3, 4 slidably mounted on the mandrel and connected by the outwardly bowed springs 5 adapted to frictionally engage the inside of the casing 6 to be perforated.

The stock is equipped with one or more tubular barrels 7 which may be screwed therein. Preferably a plurality of barrels are provided and they are spaced apart along the stock as well as around it so that the casing will be perforated all the way around and for the required longitudinal distance depending on the thickness of the producing stratum. Within the stock opposite each barrel there is provided a chamber 8 for containing an explosive charge 9. Mounted in each barrel there is a projectile 10 whose outer end fits closely within the barrel and is pointed. The inner end of the bore of each barrel is flared, as shown in Figure 3, the larger end of said bore being of somewhat greater diameter than the corresponding diameter of the chamber 8 so that a substantial portion of the force of the explosion will be exerted against the projectile to eject the same and not expended against the opposing end of the barrel 7. The inner end of each projectile may be attached to, and may extend through, a suitable material preferably a soft metal disk 11 preferably formed of lead. Accordingly, when the chamber 9 is filled with the charge and the projectile 10, with its attached disk, is inserted into place to close said chamber and when the barrel 7 is screwed home its inner end may engage against the margin of the disk 11 and clamp said margin between the inner end of the barrel and the bottom of the bore into which the barrel 7 is screwed; or the inner end of the barrel, when the barrel is in home position, will maintain the chamber sealing material securely in place thus forming a very efficient seal all the way around the outer end of the chamber 9. This prevents any moisture from reaching the explosive charge when the gun is lowered into a well containing liquid. The bullet may be coated with a soft metal as copper or lead to give lubrication to the gun barrel bore and retard ejection by providing a closer fit.

The operating mechanism housing 2 contains a cylindrical chamber 12 into which the frame 13, of a general cylindrical shape, is fitted. This frame is inserted from beneath before the stock is connected to the operating mechanism housing 2.

Within the chamber 12 and abutting the lower end of the frame 13, and attached thereto, there is a cylindrical block 14 containing the vertically, movable firing pin 15 which is resiliently mounted on the coil spring 16 contained within said block. There is mounted within said block a lever 17 one end of which is pivoted and whose other end is provided with a projecting pin 18 which extends into a vertically, widened slot 19 in the block 14. The lever 17 normally lies on the upper end of the firing pin as shown in Figures 2 and 6.

The lower end of the frame 13 has a transverse groove 20 in which a safety slide 21 is mounted. One end of this slide is pivotally connected to one end of a control lever 22 which works in a vertical slot 23 in the frame 13 and which is pivoted, at an intermediate point, to said frame. The upper end of the control lever 22 has a universal connection with a radially extended rod 24 which works through a stuffing box 25 forming a seal about said rod and whose outer end is connected to the lower end of the actuating lever 26. This actuating lever is countersunk into an external groove 27 in the upper end of the housing and is pivoted at an intermediate point. The upper end of the lever 26 is seated against a coil spring 28 confined within a socket 29 in the mandrel 2. When the lower collar 4 is in its upper position as shown in Figure 1 the upper end of the lever 26 will be forced inwardly placing the spring 28 under compression and the lower end of the lever 26 will be held in its outer position thus operating through the lever 22 to hold the safety slide 21 in its active position as shown in Figure 2 and for a purpose to be hereinafter explained.

Mounted in the frame 13 there is a timing device, indicated generally by the numeral 28. The internal mechanism of the timeing device has not been shown since it may comprise a conventional clock works mechanism which may include a driven shaft 29 arranged to be driven by a spring geared to the shaft 29 by conventional gearing. The timing device may have a dial 30 thereon and on one end of the shaft 29 there is an indicating hand 31 through which the shaft 29 may be turned and the spring of the timing mechanism placed under tension. On the other end of the shaft 29 there is a disk 32 provided with a cam face 33 thereon. Mounted within the frame 13 there is a trigger 34 which is pivoted at a point intermediate its ends. A yieldably mounted plunger 35 normally presses against the lower end of the trigger and holds the upper end of the trigger, in the path of the cam 33.

Mounted for vertical movement in the frame 13 there is a rod 36 which works through a gland 37 screwed into said frame. The rod 36 has a stop 38 thereon spaced beneath said gland and a coil spring 39 surrounds said rod and is interposed between the gland 37 and the stop 38. The trigger 34 has an upwardly beveled catch 40 which may be engaged underneath the stop 38 and maintained in said engagement by the yieldable plunger 35. This catch holds the spring 39 under compression thus maintaining the firing mechanism cocked. When the cam 33 engages the upper end of the trigger 34 the catch 40 will be disengaged from underneath the stop 38 and the spring 39 will drive the rod, or hammer, 36 downwardly.

Should the safety slide 21, at this time, be in active or safety position, the lower end of the rod 36 will strike said safety slide and the charge will not be fired. On the other hand should the safety slide 21 be in inactive position an opening 41 therethrough will be in alignment with the rod 36 and the lower end of the rod will be projected on down through the opening 41 and

against the lever 17 which, in turn, will be driven against the firing pin 15. Fitted between the firing pin block 14 and the filler block 42, within the lower end of the chamber 12, there is a breech block 43 having a central bore to receive the cartridge 44. This cartridge is aligned with the firing pin and when the latter is driven, as above explained, the cartridge will be fired.

The assembly above described within the chamber 12 may be maintained in assembled relation by the inside plug 45 screwed into the lower end of said chamber.

A channel 46 leads downwardly through the filler block 42, the nut 45 and on down to the chamber 8. Upon firing of the cartridge 44 the flame will be communicated through the channel 46 with the explosive charge 9. The disc 11 will hold the projectile 10, temporarily, against ejection until the maximum pressure has been built up in the chamber 8 whereupon said disc will be disrupted and the projectile 10 will be ejected radially with great force and will perforate the casing 6. The explosive charges in the chambers beneath will be successively ignited through the channels 46a, 46b leading on downwardly from the upper chamber 8 as is illustrated more clearly in Figure 3 and the projectiles will be ejected out radially in succession from above downwardly. The upper end of any channel 46 may be controlled by a downwardly opening, back pressure valve 47 which is mounted in the block 42 and which restrains the force of the explosion upwardly. A chamber 46c is provided for an auxiliary firing charge and may be used for a back pressure valve 47.

Within the frame 13 there is an inside, annular shoulder 48 whereon is seated a resilient cushion preferably in the form of a coil spring 49 through which the lower end of the rod 36 works. When said rod is driven downwardly the stop 38 engages the upper end of said cushioning member and places the same under compression. This spring 49 is strong enough to return the rod 36 upwardly after it is struck so that its lower end will clear the safety slide 21.

Opposite the breech block 43 there is a removable plug 50 which is screwed into the housing 2 and which may be removed for access to the block 43 so that the same may be readily removed or replaced; also, opposite the dial 30 there is a removable plug 51 screwed into the stock 1 which may be removed for access to the hand 31 or to the cocking and recocking means, or both. It is obvious that the hand may be moved any selected distance around the dial thus placing the clock spring under the desired tension and moving the cam 33 the desired distance from the upper end of the trigger 34. The length of time after setting the mechanism for firing and until the firing actually occurs may thus be readily controlled by the operator.

Pivotally mounted on the frame 13 there is a bell crank 52, one end of which is opposite the opening into which the plug 51 is screwed, said end having a notch 53 in the forward side thereof. The other end of the bell crank is bifurcated and embraces the upper end of the rod 36. This bell crank works in a transverse slot 54 in the upper end of the frame 13. The upper end of the rod 36 has side rollers as 55 thereon and when it is desired to cock or recock the firing mechanism the plug 51 may be removed and an instrument such as a screwdriver engaged in the notch 53 and upon inward pressure being applied the other end of the bell crank will be moved upwardly as indicated in dotted lines in 52 thus elevating the rod 36 until the stop 38 passes above, and is engaged by, the catch 40.

At times it may become desirable to lower the gun into the well with the breech block 43 removed, for example, to ascertain that the casing is clear and unobstructed. For this purpose the gun may be assembled with the firing mechanism cocked and ready for action but before lowering the plug 50 may be unscrewed and the breech block removed and said plug screwed back into place so that there can be no possibility of the gun being fired while used in this manner. Thereafter, the gun may be elevated and the breech block 43 inserted into place and the gun again lowered to the point where the casing is to be perforated and fired.

The upper end of the mandrel 2a may have oppositely arranged side slots 56 wherein the locking levers 57, 57 are pivotally mounted. Interposed between the lower ends of these levers there is a coil pressure spring 58 normally tending to press said lower ends apart. The extreme lower ends of said levers have the external shoulders 59, 59 engageable underneath the upper collar 3. The extreme upper end of the mandrel 2a is reduced and externally threaded and screwed thereon there is a ring nut 60. Above the ring nut and screwed onto the upper end of the mandrel and into abutting relation with said nut there is a cable socket 61 whereby the cable 62 is attached to the gun. Slidably mounted on the upper end of the mandrel beneath the ring nut 60 there is a sleeve 63 having the upper and lower external, annular grooves 64 and 65, the former of which is of greater depth than the latter. The upper ends of the levers 57 have the inwardly directed dogs 66, 66 which, when engaged in the lower groove 65, will hold the upper ends of the levers 57 apart with the shoulders 59 retracted inwardly out of engagement with the upper collar 3.

With the gun assembled and in the position shown in Figures 1, 2 and 3 it may be lowered into the casing to be perforated. The outwardly bowed wiper springs 5 will frictionally engage the inside of the casing and will hold the upper collar 3 against the external, annular shoulder 67 formed by the enlargement of the mandrel as more clearly shown in Figure 13. The lower collar 4 will thus engage the upper end of the actuating lever 26 and hold the lower end of said last-mentioned lever in its outer position which will, operating through the rod 24 and the lever 22, hold the safety slide 21 in its active position, that is, with the perforation 41 out of alignment with the lower end of the rod 36. Before lowering the gun, however, the hand 31 has been actuated to place the spring of the clock mechanism under tension and to start the operation of said clock mechanism, or timing device. Should the predetermined time expire before the gun has been lowered to the desired place or before it is desirable that the charges be fired the cam 33 will nevertheless actuate the release trigger 34 thus releasing the rod 36 to the operation of the spring 39. However, the operation of the firing mechanism will be ineffective since the lower end of the rod 36 will strike against the safety slide 21 and the firing pin 15 will not be actuated.

Assuming, however, that the gun had been lowered into the well within the selected time and it is desired to perforate, the operator may slight-

ly elevate the gun stock. The wiper springs **5**, however, will hold the collars **3** and **4** stationary during this upward movement of the stock and the shoulders **59** will pass up through the upper collar **3** and the upper end of the actuating lever **26** will also move upwardly through the lower collar **4**. It will be noted from an inspection of Figure 9 that the upper end of the actuating lever **26** is widened outwardly and when this outwardly widened portion passes above the collar **4** the upper end of the lever **26** will be forced outwardly by the spring **28** and its lower end forced inwardly operating through the rod **24** and the lever **22** to move the slide **21** to bring the opening **41** into alignment with the lower end of the rod **36** and then when the cam **33** comes into contact with the upper end of the trigger **34** and actuates said trigger, the catch **40** will be released from the stop **38** and the rod **36** will suddenly move downwardly striking the lever **17** which in turn will drive the firing pin **15** against the percussion cap of the cartridge **44** firing said cartridge and successively firing the charges **9** as hereinabove explained. The mechanism is clearly shown in firing position in Figure 6.

When the charges have been fired the gun may be then withdrawn from the well casing. If, the gun is to be withdrawn before the same is fired it will be desirable to lock the safety slide actuating means against operation. In such event the stock **1** should be lowered until the shoulders **59** are beneath the collar **3** and a go-devil **68** dropped over the cable which will land on the upper enlarged end of the sleeve **63** and drive the same downwardly into abutting relation with the upwardly facing shoulder **69** of the mandrel thus unseating the dogs **66** from the groove **65** and allowing them to seat in the groove **64**. The lower ends of the levers **57** will thus be free to move apart under the influence of the spring **58** and they will engage underneath the collar **3** as shown in Figure 12, which collar will be locked against longitudinal movement relative to the mandrel between the shoulders **57** and **67** and the lower collar **4** will be held against the widened upper end of the lever **26** thus locking the safety slide **21** in active position.

In the modification shown in Figures 10 and 11 means have been shown for locking the safety slide **21** in active position so as to prevent firing of the gun while manipulating the gun up or down in the well. In the form shown in these figures the sleeve **63***a* has been substituted for the sleeve **63** shown in Figures 1, 9, 12 and 13. In order to make the substitution the cable socket **61** and the ring nut **60** may be unscrewed and the sleeve **63** removed and the sleeve **63***a* substituted therefor and the nut **60** and socket **61** then screwed back in place. The lower end of the sleeve **63***a* is downwardly tapered, said downwardly tapering portion for wedging between the dogs **66**, **66** holding the upper ends of the levers **57** apart and locking the shoulders **59** underneath the collar **3** which in turn will hold the collar **4** against the widened end of the actuating lever **26**, all as clearly shown in Figure 10. The gun may then be moved up or down within the casing without moving the safety slide which will remain in its active position. When it becomes desirable to fire a charge the go-devil **68** may be dropped over the cable **62** and will land on the enlarged upper end of the sleeve **63***a* and drive the same downwardly thus forcing the upper ends of the levers **57** apart and disengaging the shoulders **59** from underneath the collar **3**.

Upon upward movement of the gun stock the collars **3** and **4** will be held stationary by the wiper springs **5**, the upper widened end of the lever **26** will be released and the spring **28** will force said upper end outwardly thus actuating the lever **22** as above explained to move the slide **21** into position to align the opening **41** beneath the rod **36** so that firing will occur at the preselected time. The locking mechanism illustrated in Figures 10 and 11 is shown in released position in Figure 11.

In the embodiment illustrated in Figure 14 an approximately cylindrical frame **13***a* is located in the chamber **12** and slidably mounted in the groove **20***a*, across the lower end of the frame, there is the safety slide **21***a* having the downwardly flared opening **41***a* therethrough, said safety slide being connected to the lower end of the control lever **22**. This safety slide **21***a* is considerably thicker, vertically, than the slide **21** shown in Figure 2. It is maintained in active position and may be actuated to inactive position in the same manner as heretofore explained in connection with the safety slide **21**. In this form the rod **36***a* may be mounted in the frame **13***a* and is equipped with the compression spring **39** interposed between the gland **37** and the stop **38** as hereinabove described in connection with Figure 2.

When the firing mechanism is cocked the lower end of the rod, or hammer, **36***a* rests on the upper surface of the safety slide **21***a*. When the gun is lowered into the well to the desired point, the stock may be elevated by the operator in the manner hereinbefore described in connection with the form illustrated in Figures 1 to 3 and Figures 10 and 11 and the control lever **22** will be actuated to move the safety slide **21***a* to inactive position and the rod, or hammer, **36***a* will be driven by the spring **39** through the opening **41***a* and against the lever **17** thus driving the firing pin **15** against the cartridge causing the firing of the charge, or charges, **9** and the ejection of the projectiles.

In the form illustrated in Figure 15 a frame **13***b* is mounted in the chamber **12** and the rod, or hammer, **36** is mounted therein in the same manner as illustrated and described in connection with Figure 2. The rod, or hammer, **36** may be held cocked, with the spring **39** under compression by means of a trigger **34***a* which has an upwardly beveled catch **40** engageable underneath the stop **38**. Slidably mounted in the groove **20***b*, across the lower end of the frame **13***b*, there is a safety slide **21***b* which is also provided with the opening **41**. In this form the safety slide **21***b* is normally held in active position, with the opening **41** out of alignment with the lower end of the rod, or hammer, **36** by the type of locking mechanism shown in Figures 1 to 3, inclusive, or the type shown in Figures 10 and 11. A gun of this type may be lowered into the well in the manner hereinabove described and when the point is reached at which it is desired to perforate the casing the stock may be elevated in the manner hereinabove described operating as described through the control levers **22** to move the safety slide **21***b* so as to align the openings **41** thereof with the lower end of the rod **36**. At the same time the boss **21***c* on the safety slide **21***b* will engage the lower end of the trigger **34***a* releasing the catch **40** from the stop **38** whereupon the rod, or hammer, **36** will be driven against the lever **17** which in turn will cause the firing pin **15** to fire the cartridge **44** and the charge, or charges, **9** will

thereupon be fired in the manner hereinabove described.

It is to be noted in connection with the forms in Figures 14 and 15 that no timeing device is present.

In the form shown in Figure 16 electric firing means have been provided in connection with a timing device. In this form there is a timeing device 28a and generator 70 of electric energy mounted in the chamber 12. A rod 24a works through the stuffing box 25 and has its outer end connected to the lower end of the actuating lever 26 and has its inner end conected to the electric switch 71 whereby the wiring 72, 73 may be electrically connected. With the lower end of the lever 26 locked in its outer position, as hereinabove described, the switch 71 will be open but when the stock is elevated by the operator and the lower end of the lever 26 moves inwardly the switch 71 will be closed and wiring 74, 75 which lead, from the battery and the timing device, respectively, and are connected to a heating element or cap adjacent the charge 9. In this form of the gun the hand 31a of the timeing device 28a causes a switch element to make contact with a corresponding switch element at which the wiring terminates so that when the switch 71 is closed and when the timeing device completes a circuit between the wiring 73, and the wiring 75 an electrical circuit will be completed through the heating element at the explosive charge thus causing firing of the charge and the ejection of the corresponding projectile 10. This form of gun may be provided with a plurality of charges 9 and projectiles 10. In such event there will also be wiring as 74a, 75a leading to heating elements at the other charge, or charges 9, said wiring 74a being connected with the wiring 74 and the wiring 75a terminating in a switch point in the timing device to complete a circuit through said wires 74a, 75a to cause firing of the charge. The charges may thus be fired in succession as the timing device makes contacts and successively completes circuits through the wiring leading to the respective charges. The firing of any charge may be prevented by a timely predetermined movement of the gun in the casing.

In this general form of the gun it may be found desirable to dispense with the timing device. In such event the wire 75 may be connected directly to the wire 73, that is, these two wires may be connected to form a common wire leading to the switch 71. Upon closing of said switch 71, the charge 9 will be ignited and if desired a plurality of charges may be ignited in succession by providing bores such as 76 for leading the flame from one explosive charge to the next succeeding charge.

The controlling device, for the tool, as illustrated in Figures 9, 10 and 11 while shown in connection with a perforating gun for wells is capable of general use for controlling the operation of other well tools.

The drawings and description are merely illustrative of the principle of the invention but the invention is not intended to be limited thereby except as defined by the appended claims.

What we claim is:

1. A perforating gun for well casings comprising a stock having a chamber, an explosive charge therein, a projectile mounted in the stock to be projected by the explosion of the charge, firing means for the charge, safety means for preventing effective operation of the firing means, means for locking said safety means in active position to allow positioning of the gun at a selected depth in the well irrespective of movements of the gun required for said positioning process, said locking means being adapted to be positively unlocked at the will of an operator at the ground surface to allow the charge to be fired.

2. A perforating gun for well casings shaped to be lowered into the casing and comprising a body having a chamber, a projectile in the body arranged to be projected therefrom upon explosion of the charge, an ignition charge in the body, preset, active firing mechanism including a spring pressed longitudinal plunger for causing firing of the ignition charge, safety means for preventing effective operation of the firing mechanism and means operable upon or within a limited time after a predetermined movement of the stock in the casing to render the safety means inactive to allow effective operation of the firing mechanism to fire the gun.

3. A perforating gun for well casings comprising a stock having a chamber, an explosive charge in the chamber, a projectile mounted in the stock to be projected therefrom by the explosion of the charge, an ignition charge in the stock, said stock having a passageway providing for communication of the flame from the ignition charge to the explosive charge, means for firing the ignition charge locked on down movement of the stock in the casing and arranged to be rendered operative by movement of the stock in the casing and means for locking the safety means in active position for upward movement, or withdrawal, of the gun after it has once been placed in the casing.

4. A perforating gun for well casings comprising a stock having a chamber therein, an explosive charge in the chamber, a projectile mounted in the stock and arranged to be projected by the explosion of the charge, an ignition charge in the stock, said stock having a passageway providing for communication of the flame from the ignition charge to the explosive charge, firing mechanism for firing the ignition charge, safety means for preventing effective operation of the firing mechanism on down movement of the stock in the casing and means operable upon movement of the stock in the casing to render the safety means inactive to allow the firing mechanism to effectively operate to fire the ignition charge and means for locking safety means in active position for upward movement, or withdrawal, of the gun after inserting the same in the casing.

5. A perforating gun for well casings comprising a body shaped to enter the casing and having a chamber therein, an explosive charge in the chamber, a projectile in the body arranged to be projected therefrom upon explosion of the charge, an ignition charge in the body having connection with the chamber for communication of the flame from the ignition charge to the explosive charge in the chamber, firing mechanism for firing the ignition charge, safety means for preventing effective operation of the firing mechanism, means for locking said safety means in active position on a down movement of the stock in the casing and said locking means being releasable upon a predetermined movement of the stock in the casing to allow the safety means to move to inactive position to permit effective operation of the firing mechanism to fire the ignition charge and means for locking safety

means in active position for upward movement or withdrawal of the gun from the casing.

6. A perforating gun for well casing comprising a body shaped to enter a well casing and having a chamber therein, an explosive charge in the chamber, a projectile in the body arranged to be projected therefrom upon explosion of the charge, an ignition, or primer, charge in the body, said body having a passageway from the ignition charge to the chamber, firing mechanism for firing the ignition charge, safety mechanism for preventing effective operation of the firing mechanism, means for holding the safety mechanism in active position during positioning of the gun to the desired depth in the casing regardless of any rotary or up and down movement, or both, necessitated for positioning the gun in the casing and means operable upon or after such release to render the safety means inactive to allow effective operation of the firing mechanism to fire the ignition charge.

7. A perforating gun for well casings comprising a body shaped to enter the casing and having a chamber therein, an explosive charge in the chamber, a projectile in the body arranged to be projected therefrom upon explosion of the charge, a firing charge in the body, said body having a passageway from the firing charge to the chamber, mechanism for firing the firing charge, safety means for preventing effective operation of the firing mechanism, means for locking the safety means in active position for movement of the gun in both directions in the casing, means under the control of the operator for releasing the locking means, means for moving safety mechanism to inactive position upon such release to allow effective operation of the firing mechanism to fire the ignition charge.

8. A perforating gun for well casings comprising a body shaped to enter the casing and having a chamber therein, an explosive charge in the chamber, a projectile in the body arranged to be projected therefrom upon explosion of the charge, a firing, or primer, charge in the body, said body having a flame passageway between the firing charge and said chamber, mechanism for firing said firing charge, said mechanism including a yieldingly mounted impact member and a timing controlled releasable means for holding the impact member in cocked, or inactive, position, safety means for preventing effective operation of the impact member and means operable upon or after predetermined movement of the stock in the casing to render the safety means inactive to allow effective operation of the impact member to effect ignition of said firing charge, locking means for the safety means operative regardless of any rotary or up and down movement, or both, that may be required during positioning of the gun to the desired depth.

9. A casing perforating gun comprising a stock shaped to be lowered into a well casing and having a chamber, means for lowering the gun to the desired depth in the casing, an explosive charge in the chamber, a projectile in the stock arranged to be projected through the casing upon firing of the charge, a primer charge for firing the explosive charge, means for firing the primer charge, safety means arranged to render the operation of the firing means ineffective and arranged to be actuated by an upward movement of the stock in the casing, to a position to allow the firing means to operate effectively to fire the primer charge, means for locking safety mechanism in active position during positioning of the gun to desired depth regardless of rotary or up and down movement, or both, that may be required for positioning and means under temporary control of the operator to positively unlock the locking means so that the gun can be fired.

10. A casing perforating gun comprising a body including a stock and shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, a projectile in the stock arranged to be projected through the casing upon firing of the charge, a primer charge for firing the explosive charge, means for firing the primer charge, time controlled means for controlling the operating of the firing means, safety means arranged to render the operation of the firing means ineffective and arranged to be actuated, by predetermined movement of the body in the casing, to a position to allow the firing means to operate effectively to fire the primer charge, means for locking safety mechanism in active position for positioning the gun to desired depth and means under control of an operator at the ground surface for unlocking the locking means so that the safety means may be actuated.

11. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, a projectile in the body arranged to be projected through the casing upon firing of the charge, a primer for firing the charge, a percussion device for firing the primer, and movable to active or cocked position, time controlled release means for releasing the percussion means to permit the latter to move to active position to effect firing of the primer, safety means arranged to render the operation of the firing means ineffective and arranged to be actuated, by a predetermined movement of the stock in the casing, to a position to allow the firing means to operate effectively to fire the primer, predetermined locking or unlocking means under the control of an operator at the ground surface for locking or unlocking the safety means.

12. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, a projectile in the chamber arranged to be projected through the casing upon firing of the charge, a primer for firing the charge, firing means for the primer including a spring actuated percussion device, or hammer, for firing the primer, safety means arranged to hold the percussion device or hammer in cocked or inactive position and arranged to be actuated, by predetermined movement of the stock in the casing, to a position to allow the percussion device or hammer to operate effectively for firing the primer.

13. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, a projectile in the body arranged to be projected radially therefrom upon firing of the charge, a primer for firing the charge, a spring actuated percussion device for firing the primer, means for releasably holding the percussion device inactive, safety means normally in active position and effective when in said position to render the operation of the percussion firing means ineffective and arranged to be actuated, by predetermined movement of the body in the casing, to a position to allow the firing means to operate effectively to fire the primer and means

for releasing the holding means, upon such actuation of the safety means, to permit said effective operation of the percussion firing means.

14. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, means for positioning the gun at a selected location in said casing, a projectile in the body arranged to be projected outwardly therefrom upon firing of the charge, electrical means operative to ignite the charge, means including a switch normally maintaining the electrical means inoperative so as not to ingite the charge and arranged to be actuated, by utilizing the positioning means, to close said switch and by that act to render the electrical means operative to fire the charge by direct lead from said switch to at least one charge.

15. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a plurality of chambers, an explosive charge in each chamber, projectiles in the body arranged to be projected outwardly therefrom upon firing of the respective charges, electrical means including electrical conductors leading to the respective charges and having ignition elements for firing the charges, means arranged to be actuated, by predetermined movement of the body in the casing, to complete or break said circuits and time controlled devices forming the sole means for automatically completing said circuits to successively fire said charges.

16. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a plurality of chambers, said body being provided with a flame passageway arranged for establishing firing communication between the chambers, projectiles mounted in the body and arranged to be projected outwardly therefrom upon firing of the charges, a primer for firing one of the charges, means for firing the primer, safety means effective to render the firing means inoperative during downward movement of the stock and arranged to be actuated, by a predetermined movement of the body in the casing, to a position to allow the firing means to operate effectively to fire the primer, locking or unlocking means as predetermined by and under control of an operator at the ground surface to lock or unlock the device for further actuation of the gun.

17. A perforating gun for well casings comprising a body shaped to be lowered into a well casing and having a chamber therein and a bore positioned outwardly of the chamber, a gun barrel secured in the bore, a projectile in the barrel, a soft disc shaped metal anchor secured around the inner end only of the projectile and closing the chamber to retain an explosive charge therein, the margin of the anchor being positioned to be engaged by the inner end of the barrel, when the barrel is in home position, whereby the margin of the anchor will be clamped between the inner end of the barrel and the inner end of the bore to form a fluid tight seal and to restrain immediate ejection of the projectile upon firing of the charge and means for firing the charge.

18. A perforating gun for well casings comprising a body shaped to enter a well casing, an explosive charge therein, a projectile mounted in the body to be projected by the explosion of the charge, time control means for firing the charge and a removable plug in the side of the body for access to the time control means.

19. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, a projectile in the body arranged to be projected through the casing upon firing of the charge, an ignition charge for firing the explosive charge, a percussion device for firing the ignition charge and movable to active or cocked position, means for manually cocking, and recocking, the percussion device, a removable plug in the body for access to said cocking and recocking means and means arranged to be controlled, by a predetermined movement of the body in the casing to effect actuation of the percussion device to fire the ignition charge.

20. A perforating gun for well casings comprising a body, an explosive charge therein, a projectile mounted in the body to be projected therefrom by explosion of the charge, a breech block in the body, an ignition charge in the breech block, a removable plug in the body for access to the ignition charge to allow removal or insertion of the block and ignition charge and means for firing the ignition charge.

21. A perforating gun for well casings comprising a body shaped to be lowered into a well casing and having a chamber, an explosive charge in the chamber, a projectile mounted in the body to be projected therefrom by the explosion of the charge, a breech block an ignition charge in said block in firing communication with the explosive charge, said body having an opening for access to the breech block and ignition charge to permit the insertion or removal thereof, and removable means for closing said opening.

22. A perforating gun for well casing comprising a body shaped to enter a well casing and having a chamber therein, an explosive charge in the chamber, a projectile in the body arranged to be projected therefrom upon explosion of the charge, an ignition, or primer, charge in the body, said body having a passageway from the ignition charge to the chamber, firing mechanism for firing the ignition charge, safety means between the firing mechanism and the ignition charge for preventing effective operation of the firing mechanism, means for locking the safety means in active position during the downward movement of the gun through the casing and means for locking the safety means in active position for upward movement of the gun body in the casing for withdrawing same from the casing, said locking means being under the control of the operator.

23. A casing perforating gun comprising a body shaped to be lowered into well casing and having chambers, an explosive charge in the chambers, projectiles in the body arranged to be projected outwardly therefrom upon firing of the charges, walls forming a recess in gun body, self-contained electrical means, including an electric switch, carried in the recess and operative to ignite the charges, means normally maintaining the electrical means inoperative and arranged to be actuated thereby directly conducting electric energy to at least one charge by way of a preplaced heating element or elements arranged to ignite at least one charge or the charges.

24. A casing perforating gun comprising a body shaped to be lowered into a well casing and having chambers, explosive charges in the chambers, projectiles in the body arranged to be projected outwardly therefrom upon firing of the charges, walls forming a recess in gun body, self-contained electrical means, including an electric switch, carried in the recess and operative to

ignite the charges, means normally maintaining the electrical means inoperative and arranged to be actuated, by a single predetermined movement of the stock in the casing, to control the switch and thereby directly rendering energy to preplaced heating elements arranged to ignite the respective charges.

25. A casting perforating gun comprising a body shaped to be lowered into a well casing and having a plurality of chambers, an explosive charge in each chamber, projectiles in the body arranged to be projected outwardly therefrom upon firing of the respective charges, electrical means including electrical conductors leading to the respective charges and having ignition elements for firing the charges, means arranged to be actuated, by way of predetermined utilization of the positioning means, to complete a circuit to a timing device or time controlled device which completes a circuit to each ignition element automatically as the timing device or timing controlled device actuates and arranged to thereby be able to prevent the shock to the gun of the force of the explosive charges from being ignited one upon another.

26. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a plurality of chambers, an explosive charge in each chamber, projectiles in the body arranged to be projected outwardly therefrom upon firing of the respective charges, a recess in the gun body, self-contained electrical means mounted in the recess, including electrical conductors leading to the respective charges and having ignition elements for firing the charges, means arranged to be actuated, by a single predetermined movement of the body in the casing, to complete or break, said circuits and time controlled means for automatically completing said circuits successively to selectively fire said charges in succession.

27. A perforating gun for well casings comprising a body, an explosive charge or charges therein, a projectile or projectiles arranged in the body to be shot therefrom by explosion of the charge or charges, firing means for the charges arranged to be operative, safety means arranged to block effective operation of the firing means regardless of any rotary or up and down movements, or both, that may take place for the process of positioning the gun to desired depth in the casing and regardless of the time element involved to lower and withdraw the gun, said safety means including means held away from the rest and under the will of an operator for losing control of the safety when it is desired to fire the gun.

28. A perforating gun for well casings comprising a body, explosive charges therein, projectiles mounted therein arranged to be shot therefrom by explosion of the charges, firing means for the charges arranged to be ignited and controlled by a predetermined movement of the body in the well casing, safety means for the firing means, locking means for the safety means having an exchangeable part under the control of the operator and means for actuating said exchangeable part so that, as predetermined and arranged said safety means may be locked or unlocked as required.

29. A tool for use in a well, comprising a body shaped to enter a well, a mandrel formed by the tool, a member slidably carried on the mandrel and having frictional engagement with the well walls, locking or unlocking means arranged to be under the control of the operator to lock or unlock said friction member so that the tool may be actuated by a predetermined movement of the tool in the well.

30. A casing perforating gun having a body shaped to be lowered in a well casing, said body having a plurality of chambers, said body being provided with a passageway for establishing firing communication between the chambers, a removable plug for forming a continuation for said passageway to allow effective firing communication, projectiles including their firing charges arranged in the chambers so as to be ejected outwardly therefrom upon firing the firing charges, and means for igniting said firing charges.

31. A casing perforating gun comprising a body adapted to be moved in a well casing, chambers in series therein, projectiles including explosive charges mounted in said chambers, self-carried electrical means carried by the body down the well casing and arranged to ignite the explosive charges in succession thereby ejecting the projectiles, safety means for the electrical means arranged to normally hold the electrical means inactive or incapable of causing ignition, means for actuating safety mechanism under control of the operator so that electrical means will ignite the explosive charges in longitudinal series.

32. In a perforating gun having a stock provided with a chamber for an explosive charge, a barrel in the stock having a bore whose inner end is flared to a larger diameter than that of the chamber; a projectile in the barrel, a soft metal disc around and secured to the projectile and which closes said chamber and whose margin is clamped between the inner end of the barrel and the stock.

33. A perforating gun for well casings comprising a stock having a chamber, an explosive charge therein, a projectile mounted in the stock to be projected by the explosion of the charge, spring actuated firing mechanism for firing the charge arranged to be rendered operative by movement of the stock in the casing, means for rendering the firing mechanism inoperative including an actuating lever, a locking device for locking the lever against movement and a locking dog effective to positively hold the locking device in locking position.

34. A perforating gun for well casings comprising a stock having a chamber, an explosive charge therein, a projectile mounted in the stock to be projected by the explosion of the charge, firing mechanism for firing the charge, means locked against movement relative to the stock for rendering the firing mechanism ineffective to fire the charges when either rotary or up and down movements, or both, are necessitated during the positioning process, said means being releasable at the will of the operator and upon such release being arranged to allow an independent movement of the stock to render the firing mechanism operative.

35. A casing perforating gun for use in a well casing including means for locating said gun at a desired location in the casing, a gun barrel carried by said gun, a projectile and a firing charge carried by said gun and arranged to allow for ejection of the projectile through the gun barrel, firing means for the charge including a single electric switch, and means arranged to be effective through utilization of the locating means to actuate said electric switch to open or closed position as desired.

36. A casing perforating gun comprising a body

adapted to be used in a well casing, means for lowering the body into or raising same out of the casing, projectiles and explosive charges carried by said body arranged so that the projectiles will be ejected after ignition of the explosive charges, a primer for exploding a charge, a series of explosive charge chambers for the explosive charges having ignition communication, means controlled by the lowering means for firing the primer, and means arranged relative to the communication system to direct in a desired direction, active ignition means from an exploding charge for exploding another charge and so as to control the direction of said ignition means to prevent ineffective dissipation thereof to conserve the explosive charge to effectively eject the corresponding projectile and ignite other firing charges carried by the body.

37. A casing perforating gun comprising a body adapted to be used in a well casing, means for moving said body in the casing, projectiles and explosive charges carried by said body arranged so that the projectiles will be ejected upon ignition of the explosive charges, a primer, means for activating the primer for an explosive charge, a series of explosive charge chambers for the explosive charges arranged with ignition communication, means arranged relative to the communication system to positively direct active ignition means for primer purposes and to control the direction of active ignition means to prevent ineffective dissipating thereof thereby conserving the explosive and ignition means to effectively eject the projectiles to perforate the casing and surrounding material and ignite other ignition means carried by the body, means for preventing the ignition means from activating an explosive charge upon downward movement of the gun, said last named means being controlled by manipulation of the moving means.

38. A perforating gun for well casing comprising a body adapted to be used in a well casing, a projectile and an explosive charge arranged in the body to be ejected therefrom upon explosion of the charge, firing means for the charge, a frictional engaging device slidably carried in the casing by the gun body, locking means for the engaging device arranged so that the body of the gun may be moved in any predetermined direction in the well casing without allowing the effective operation of the firing means to cause explosion of the charge, means for unlocking the locking means so that the gun body may be actuated to allow effective operation of the firing means.

39. A perforating gun for well casing comprising a body adapted to be used in a well casing, projectiles and explosive charges mounted therein and arranged so that the explosion of a charge will be effective to eject the corresponding projectile, firing means for the charges so arranged that by a predetermined movement of the body in the casing the firing means will be allowed to become effective to ignite the charges, a frictional engaging device carried by the body and being capable of frictional engagement with the well casings, means under the control of an operator for temporarily locking said device to a predetermined relationship between the operative firing means and itself so that the body may be moved in any desired direction in the casing without destroying the relationship, means for unlocking the locking means so that predetermined movement of the body in the well casing can take place.

40. A perforating gun for wells comprising a body, suspending means for the gun, charges mounted in the body, projectiles arranged to be ejected therefrom upon ignition of the charges, firing means for the charges so arranged that upon a single movement of the body in the well the firing means will be allowed to become effective to ignite the charges, safety locking means arranged to be locked to prevent firing or unlocked to allow firing as desired upon subsequent actuation of the body.

41. A tool for use in a well comprising a body shaped to be lowered into a well, a member slidably carried on the body for frictional engagement with the well wall, locking or unlocking means under the control of the operator effective to lock or unlock said frictional member so that the body may be actuated independently or dependently thereof in the well to operate the tool.

42. A tool for use in a well comprising a body shaped to be moved in a well, a member slidably carried by the body for frictional engagement with the well wall, locking or unlocking means for controlling operable relationship between the frictional engagement member and the tool, said locking or unlocking means being under the control of an operator so that said locking or unlocking means can be controlled to allow unlocking or locking as required in order that said body may be moved in opposite directions in the well and the mechanism of the tool thereafter be controlled.

43. A perforating gun for well casing comprising a body adapted to be moved into or out of a well casing, projectiles including firing charges therein for ejection of the projectiles therefrom, firing means including a primer charge for the firing charges, means for preventing the unintentional detonation of a primer charge for the firing charge, means including a back-pressure valve for preventing the action of the firing charge or charges from ineffectual dissipation in an undesired direction and directing the force thereof in a desired direction so that each charge will effectively discharge its projectile and act as a primer for another charge so that a series of projectiles may be ejected effectively.

44. A perforating gun for well casing comprising a body adapted to be moved into or out of a well casing, projectiles including firing charges therein for ejection of the projectiles therefrom, firing means including primer means for firing the charges, means for preventing the unintentional detonation of a primer charge for the firing charge, means including a valve between any primer and any firing charge capable of allowing the action of the primer charge to activate the firing charge and also capable of directing the firing charge ignition and explosion thereafter, so that a series of projectiles may be ejected, and means for controlling the firing means.

45. A perforating gun for well casing comprising a body, projectiles mounted therein, explosion charges for the projectiles arranged to effectively eject the projectiles to cause the act of perforating, firing means for the explosive charges, a communication system for the explosive charges, a back pressure control means to prevent the escape of the force of an ignited charge and to direct the force thereof in a desired direction, a primer and means for igniting a primer to in turn ignite the corresponding charge.

46. A casing perforating gun comprising a body shaped to be positioned into a well casing and

having a chamber, means for positioning the gun in the casing, an explosive in the chamber, a projectile arranged in said gun to be projected through the well casing upon firing of the explosive charge, a primer for firing the charge, a percussion device, a hammer means, for firing the primer, safety means arranged to hold the percussion firing means in cocked or inactive position and arranged to be released, means for actuating the safety means to a position to uncontrollably let and cause the percussion firing means to operate effectively to fire the primer.

47. A tool for use in a well comprising a body shaped to be positioned in same, slider means carried for the body, frictional engagement means for frictional engagement with the well casing, an operative arrangement for said frictional engagement means and slider means, locking or unlocking means under the control of the operator effective to lock or unlock said slider means so that the body may be actuated independently or dependently thereof in the well to allow or cause the tool to act as desired, said locking or unlocking means not being automatic.

48. A tool for use in a well comprising a body shaped to be used in a well, cased or uncased, slider means carried by the body, frictional engaging means carried by the slider means for frictional engagement with the wall of the well, locking or unlocking means for controlling operable relationship between slider means and frictional engaging means and the body, said locking or unlocking being under the control of an operator so that the locking or unlocking means can be predeterminedly controlled for unlocking or locking as required in order that said body may be moved in predetermined directions in the well so the mechanism of the tool thereafter can be controlled.

49. A casing perforating gun comprising a body shaped to be positioned in a well casing and having a chamber, an explosive charge in the chamber, a projectile in the gun arranged to be projected outwardly therefrom upon firing of the charge, electrical means for igniting the charge including an electric switch normally maintaining the electrical means inoperative and a direct circuit from the switch to the charge to ignite the charge, means for actuating said electric switch and thereby rendering the electrical means effective to ignite the charge.

50. A casing perforating gun comprising a body shaped to be positioned in a well casing and having chambers, explosive charges in the chambers, projectiles in the gun arranged to be projected outwardly therefrom upon firing of the charges, electrical means for igniting the charges including a switch normally maintaining the electrical means incapable of igniting the charges and also including a circuit leading from the switch to the respective charges, means for actuating said electric switch to ipso facto render the electrical means operative to ignite the charges.

51. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a plurality of chambers, said body being provided with a flame passageway for establishing firing communication between the chambers, projectiles carried in the body and arranged to be projected outwardly therefrom upon firing of the charges, a primer for firing the charges, means for firing the primer, safety means effective to render the firing means ineffective at all times during the lowering process and means arranged to be actuated to a position to release the safety means to allow the firing means to operate effectively to fire the primer, and means for actuating the safety means.

52. A casing perforating gun comprising a body shaped to be lowered into a well casing and having a plurality of chambers, said body being provided with a flame passageway for establishing firing communication between the chambers, projectiles carried in the body and arranged to be projected outwardly therefrom upon firing of the charges, a primer for firing the charges, means for firing the primer, safety means effective to render the firing means ineffective during the movement of the gun in any direction during the process of positioning same to desired location in the well casing and means arranged to be actuated to a position to release the safety means to allow the firing means to be operated effectively to fire the primer, and means for actuating the safety means.

53. A perforating gun for well casings comprising a body shaped to be used in the casing, projectiles mounted in the body, explosive charges therein for the projectiles, firing means for the charges, a mandrel, slider means carried on the mandrel, means for locking the slider means against movement relative to the mandrel, and means for frictional engagement with the well casing operatively associated with said slider means, whereby, upon a release of the locking means, a single predetermined movement, having controlling operable relationship between the slider means and said body, ipso facto operatively allows said charges to be fired by use of the firing means, and the projectiles ejected and means for controlling said predetermined movement.

54. A perforating gun comprising a body having a barrel section provided with a plurality of laterally directed gun units having projectiles, means for positioning the gun in the well casing, a sealed housing connected with said gun body, firing mechanism within said housing including a time clock and also including at least one end of electrical connections for leading to each gun unit, said time clock being used for automatically distributing electrical energy, a source of electrical energy for said firing mechanism, means for connecting said source of energy, by use of the positioning means, through the time clock to said gun units to selectively eject the projectiles.

55. A perforator gun for use in the industry of well digging having projectiles and means for projecting same for perforating purposes, including firing means having mechanically timed fuse means for causing ignition, means for positioning the gun at desired location, and means responsive to the action of the positioning means to, ipso facto, control the act of perforating.

56. A perforator gun for use in the industry of oil production having a stock and projectiles and means for ejecting same, for perforating purposes, including firing means having mechanically timed fuse means for causing ignition, means for positioning the gun at desired location, and appurtenances arranged to be positioned in the casing by use of the positioning means and adapted to control the act of perforating.

57. A perforator gun comprising a body structure, a projectile carried thereby, and means for ejecting the projectile for perforating purposes including firing means, means for locating said body structure in a cased or uncased well, a device carried by the body structure of the gun including means for engagement with the wall of the well

ıd including releasable locking means so that it ll remain substantially temporarily as located ter body structure has bee positioned to desired cation regardless of the movement required for ›sitioning so that the locking means when re- ased will cause or allow a change in the rela- ›nship established whereby the ejection of the ojectiles can be controlled.

58. A perforator gun, suspending means for ›sitioning it in a cased or uncased well bore, ırrels carried by the gun to receive and direct ojectiles from the gun, explosive charges for ecting the projectiles, self-carried operative ing means for igniting at least one charge and cluding firing mechanism, an enclosure for aling parts of said firing means within the gun ructure, and means responsive by way of move- ent of the suspending means to release said ing mechanism to render the firing means fective for firing the explosive charges, means r locking the firing means in inoperative posi- ›n for the positioning operation regardless of ın movements during said operation and means r unlocking the locking means.

59. A casing perforating gun for use in casing, eans for locating said gun at a desired location the casing, gun barrels carried by said gun and ranged to allow for ejection of projectiles, fir- g charges for the projectiles all arranged for ection of the projectiles through the bores of e several barrels, firing means for the charges cluding an electric switch arranged for actua- ›n, means for actuating said electric switch rough manipulation or use of the locating eans for firing the firing charges, in longitudi- ıl series.

60. A casing perforating gun for use in casing, eans for locating said gun at a desired location the casing, gun barrels carried by said gun ıd arranged to allow for ejection of projectiles, ıd firing charges for the projectiles all arranged ıerein for ejection of the projectiles through ıe bores of the several barrels, firing means for ıe charges including an electric switch arranged ›r actuation, means for actuating said electric vitch through manipulation or use of the locat- g means for firing the charges, said firing eans including a time clock to run sequently › selectively eject the projectiles.

61. A perforating gun for well casing compris- ıg a body, projectiles arranged in the body for ection therefrom upon explosion of explosive ıarges therein, firing means for the charges in- uding a timing device and a switching device ranged to be actuated by the timing device to ›mplete electric circuits in succession for eject- ıg the projectiles one by one.

62. A perforating gun for well casing compris- ıg a body, projectiles arranged in the body for jection therefrom upon explosion of explosive ıarges therein, firing means for the explosive ıarges including electrical circuits and switch ıeans and a time clock arranged to move to utomatically actuate the switch means at which rcuits terminate for completing electrical cir- ıits to conduct electric energy to explosive harges either for series firing or for firing selec- vely.

63. A perforating gun for well casing compris- ıg a body, projectiles arranged in the body for jection therefrom upon explosion of explosive harges therein, an electrical system, including ring means for the explosive charges and in- luding time control means the movement of hich automatically controls the distribution of electrical energy for igniting the explosive charges.

64. A perforating gun adapted to be lowered into a well casing, projectiles and explosive charges for the projectiles arranged therein to project the projectiles upon ignition of the explosive charges, firing means for igniting said explosive charges, locking means for the firing means for locking said firing means from operating, to prevent ignition of the explosive charges during downward movement of the gun in the casing and releasable upon upward movement of said gun in the casing so that said firing means can cause ignition of the explosive charges, locking means for said firing means to prevent ignition of the firing charges, if desired, for upward movement of the gun.

65. In a perforating gun for wells, a frame of a general cylindrical shape having a transverse end groove at one end, and having a vertical side slot merging into said groove, said frame having a transverse slot at its other end, said frame having a side recess intermediate its ends.

66. In a perforating gun for wells having a body provided with a recess; a removable frame insertable into and removable from said recess and constructed to carry firing mechanism of the gun.

67. In a perforating gun having a stock provided with chambers for explosive charges, barrels in the stock each having a bore whose inner end is flared to a substantially larger diameter than that of the corresponding chamber, a projectile in each barrel, a material which together with the projectile forms sealing means for each chamber when the corresponding barrel is in home position, said sealing means when in sealing position being located between the flared end of the bore and the corresponding chamber.

68. In a well tool adapted to be lowered into and withdrawn from a well and having a shank and embodying a controllable mechanism, an instrumentality for controlling said mechanism, an element for locking said instrumentality when in one positon, and slidable relative to the shank to release said instrumentality when in another position, latch means for holding the relatively slidable member in locking position, and slidable means on the shank for operating the latch means.

69. In a well tool adapted to be lowered into and withdrawn from a well bore and having a shank and embodying a controllable mechanism, an instrumentality for controlling said mechanism, an element for locking said instrumentality when in one position and slidable relative to the shank to release said instrumentality when in another position, said locking element having means engageable with the wall of the well for frictionally holding said locking element stationary relative to the bore when the tool is moved longitudinally in one direction to cause the relative sliding of the locking element to released position, latch means for holding the locking element in locking position, while the tool is moved in another direction, and other means under the control of an operator at the ground surface effective, by impact, to operate the latch means.

70. In a well tool adapted to be lowered into and withdrawn from a well bore by a suspending element and having a shank and embodying a controllable mechanism, an instrumentality for controlling said mechanism, means for locking said instrumentality when in one position and

slidable relative to the shank to release said instrumentality when in another position, latch means for holding the locking means in locking position and other means under the control of an operator at the ground surface effective, by impact, to operate the latch means.

71. In a well tool adapted to be lowered into and withdrawn from a well bore by a suspending element and having a shank and embodying a controllable mechanism, an instrumentality for controlling said mechanism, means for locking said instrumentality when in one position and slidable relative to the shank to release said instrumentality when in another position, latch means for holding the locking means in locking position and other means slidable on the shank adapted, when in a given position, to hold said latch means in one position and upon actuation of said other means to allow said latch means to be in another position.

72. In a well tool adapted to be lowered into and withdrawn from a well bore by a suspending element and having a shank and embodying a controllable mechanism, an element for controlling said mechanism, means for locking said element when in one position and slidable rela tive to the shank to release said element when i another position, latch means for holding th locking means in locking position, a slidabl means on the shank for controlling the latc means, when said slidable means is in one posi tion and means to maintain said slidable latch controlling means at another position on th shank.

73. In a well tool adapted to be lowered int and withdrawn from a well bore by a suspendin element and having a shank and embodying controllable mechanism, an element for control ling said mechanism, means for locking said con trolling element when in one position and slid able relative to the shank to release said control ling element when in another position, means in cluding latch means adapted to be pre-set an provided for holding the locking means in lockin position, and means slidable relative to the shanl and operable in one direction by the impact o a go devil to change the pre-set position of th latch means.

JOSEPH S. McDONALD.
WALTER E. A. RUSKA.